

## 5 WHAT IS CLAIMED IS

1. A process for preparing 1,3-dibromoacetone which comprises:

10 (a) reacting acetone with bromine to make a mixture of brominated acetone derivatives and byproduct hydrogen bromide;

(b) equilibrating the mixture of brominated acetone derivatives to produce 1,3-dibromoacetone as the major product;

15 (c) crystallizing the 1,3-dibromoacetone in the mixture of brominated acetone derivatives mother liquor; and

(d) isolating the 1,3-dibromoacetone from the mixture of brominated acetone derivatives.

2. The process of Claim 1 wherein steps (c) and (d) are carried out substantially simultaneously.

20 3. The process of Claim 1 which further comprises:

(e) equilibrating the mixture of brominated acetone derivatives from step (d) to produce 1,3-dibromoacetone as the major product; and

25 (f) crystallizing the 1,3-dibromoacetone from the mixture of equilibrated brominated acetone derivatives prepared in step (e)

(g) isolating the 1,3-dibromoacetone from the mixture of equilibrated brominated acetone derivatives.

30 4. The process of Claim 2 wherein steps (f) and (g) are carried out substantially simultaneously.

5. The process of Claim 3 which further comprises repeating in sequential order steps (e), (f) and (g) until essentially complete conversion to 1,3-dibromoacetone is  
35 achieved.

6. The process of Claim 1 or Claim 3 wherein the crystallization step is carried out by suspension or solid layer crystallization.

5                   7. The process of Claim 1 or Claim 3 where the crystallization is conducted in a solvent or mixture of solvents.

                  8. The process of Claim 7 where the solvent or mixture of solvents is selected from the group consisting  
10 essentially of aromatic and aliphatic hydrocarbons, chlorinated hydrocarbons, ethers, esters, alcohols and ketones or mixtures thereof.

                  9. A process for preparing 1,3-dibromoacetone which comprises:

15                   (a) reacting acetone with bromine to make a mixture of brominated acetone derivatives and hydrogen bromide byproduct;

                  (b) equilibrating the mixture of brominated acetone derivatives to produce 1,3-dibromoacetone as the  
20 major product; and

                  (c) substantially simultaneously (i) crystallizing the 1,3-dibromoacetone and (ii) equilibrating the mixture of brominated acetone derivatives such that the conversion of  
25 1,3-dibromoacetone increases above its liquid equilibrium concentration in the mixture of brominated acetone derivatives.

                  10. The process of Claim 9 wherein the mixture of 1,3-dibromoacetone and equilibrating brominated acetone derivatives consist of greater than 75 weight percent 1,3-  
30 dibromoacetone.

                  11. The process of Claim 9 wherein solid 1,3-dibromoacetone is removed from the equilibrating mixture of brominated acetone derivatives.

                  12. The process of Claim 1 or Claim 9 wherein the  
35 brominated acetone derivatives include bromoacetone, 1,1-dibromoacetone, 1,3-dibromoacetone, and tribromoacetone.

                  13. The process of Claim 1 or Claim 9 wherein the brominated acetone derivatives include acetone, bromoacetone, 1,1-dibromoacetone, 1,3-dibromoacetone, tribromoacetone, and  
40 tetrabromoacetone.

5           14. The process of Claim 1 or Claim 3 or Claim 9 wherein the equilibration step is carried out in the presence of a catalyst.

          15. The process of Claim 14 wherein the catalyst is hydrogen bromide.

10           16. The process of Claim 1 or Claim 9 wherein in step (a) the acetone and bromine are thoroughly mixed at the beginning of the reaction such that the formation of tetrabromoacetone is prevented or substantially minimized.

          17. The process of Claim 1 or Claim 9 wherein step  
15 (a) is carried out in the presence of a solvent consisting of a mixture of brominated acetone derivatives.

          18. The process of Claim 17 wherein the brominated acetone derivatives include bromoacetone, 1,1-dibromoacetone, 1,3-dibromoacetone, and tribromoacetone.

20           19. The process of Claim 17 wherein the brominated acetone derivatives include acetone, bromoacetone, 1,1-dibromoacetone, 1,3-dibromoacetone, tribromoacetone, and tetrabromoacetone.

          20. The process of Claim 17 wherein the mixture of  
25 brominated acetone derivatives includes (i) unequilibrated product from Claim 1 or Claim 9 step (a); (ii) equilibrated product from Claim 1 or Claim 9 step (b); a mother liquor from the crystallization of 1,3-dibromoacetone in a mixture of brominated acetone derivatives; and (iv) any combination  
30 of (i), (ii) or (iii).

          21. The process of Claim 1 or Claim 9 which further comprises recovering the hydrogen bromide formed as a byproduct in the bromination of acetone and converting the hydrogen bromide to molecular bromine.

35           22. The process of Claim 21 which further comprises recycling the bromine to the acetone bromination reaction.

          23. The process of Claim 1 wherein any one of  
40 steps (a), (b), (c) or (d) is carried out in a continuous manner.

5           24. The process of Claim 9 wherein any one of steps (a), (b) or (c) is carried out in a continuous manner.

          25. The process of Claims 21 or Claim 22 where any step is carried out in a continuous manner.

          26. A process for preparing 1,3-dichloroacetone  
10 which comprises reacting 1,3-dibromoacetone with a chloride source to produce 1,3-dichloroacetone.

          27. The process of Claim 26 wherein the chloride source is selected from the group consisting of hydrogen chloride, hydrochloric acid, inorganic ionic chlorides, amine  
15 hydrochloride salts, quaternary ammonium salts, phosphonium chloride salts and combinations thereof.

          28. The process of Claim 26 wherein the reaction product includes a mixture of 1,3-dichloroacetone and byproduct bromide after the reaction step.

20           29. The process of Claim 26 including the step of isolating the 1,3-dichloroacetone.

          30. The process of Claim 26 wherein the 1,3-dibromoacetone is prepared by the process of Claim 1 or Claim 9.

25           31. The process of Claim 28 which further comprises converting the byproduct bromide to molecular bromine.

          32. The process of Claim 28 which further comprises converting the byproduct bromide to molecular  
30 bromine and regenerating the chloride source.

          33. The process of Claim 31 or Claim 32 which further comprises recycling the bromine to the acetone bromination reaction.

          34. The process of Claim 32 which further  
35 comprises recycling the chloride source to the reaction of 1,3-dibromoacetone with a chloride source.

          35. The process of Claim 31 or Claim 32 wherein the conversion of byproduct bromide to bromine is conducted using continuous reactors.

5                   36. A process for preparing epichlorohydrin which comprises:

                  (a) reacting 1,3-dibromoacetone with a chloride source to produce 1,3-dichloroacetone;

10                   (b) hydrogenating the 1,3-dichloroacetone prepared in step (a) in the presence of a catalyst to produce 1,3-dichlorohydrin; and

                  (c) cyclizing the 1,3-dichlorohydrin with a base to produce epichlorohydrin.

15                   37. The process of Claim 36 wherein the 1,3-dibromoacetone is prepared by the process of Claim 1 or Claim 9.

                  38. The process of Claim 26 or Claim 36 wherein the reaction of 1,3-dibromoacetone is conducted using continuous and/or fixed bed reactors.

20                   39. The process of Claim 29 or Claim 36 wherein the 1,3-dichloroacetone is isolated by continuous distillation or continuous extraction.